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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/689,042

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Bakul Patel

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EXAMINER

ALANKO, ANITA KAREN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 10/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/689,042

Applicant(s)

PATEL

Examiner

Anita K. Alanko

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 7/11/06 amdt.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scherber et al (US 5,858,813) in view of Wang et al (US 6,569,349 B1).

Scherber discloses a method comprising:

polishing a TiW layer (col.10, lines 15-20) with a composition comprising water (col.6, lines 29-35) and from about 0.5%-15% by weight of periodic acid (col.5, line 8, 32-34; the range encompasses the cited range) for a time and a temperature sufficient to cause the composition to remove at least a portion of the TiW alloy.

Scherber does not explicitly how the TiW barrier layer polishing step is used in combination with other steps, such as etching to form a residue and cleaning afterwards. However, these steps are suggested. For example, Scherber teaches that typically a first layer is planarized to expose the surface of a non-planar second layer (col.1, lines 35-37).

Wang teaches a method that gives more specific examples of the method disclosed by Scherber, i.e. CMP/polishing a copper layer selectively to a barrier/TiW layer (col.6, lines 49-52) with a first slurry (col.8, lines 9-13), and then removing the barrier/TiW layer with a second selective slurry (col.8, lines 20-25). This encompasses the cited steps of providing a substrate comprising an exposed TiW alloy layer and etching the TiW alloy by a method which results in

formation of etching residue. Residues are inherent in the etching process since the same method steps are conducted as in the instant invention.

It would have been obvious to one with ordinary skill in the art to provide a substrate comprising an exposed TiW alloy layer and etching the TiW alloy by a method which results in formation of etching residue in the method of Scherber because Wang teaches that this is a useful technique for planarizing substrates to enable ULSI.

Scherber does not explicitly disclose the pH of the composition, however since it comprises an acid, it is expected to be acidic. Wang also teaches that it is useful to vary the pH according to what is being polished (col.6, lines 10-17).

It would have also been obvious to use the composition at a pH of less than about 7 because Wang teaches that it is useful to vary the pH, and thus the pH appears to reflect a result-effective variable that can be optimized. See MPEP 2144.05 IIB.

Since the composition of Scherber is the same as the instant invention, the modified method of Scherber inherently has the same results of the removal rate of TiW alloy and residue thereof that is greater than a removal rate of Al, Cu or an AlCu alloy. This is also desired in order to preserve the integrity of the metal lines.

It would have been still further obvious to rinse the substrate in the modified method of Scherber in order to provide for a clean product, which improves the yield of the final product.

As to claims 9-11, since the composition of Scherber is the same as in the instant invention, it is expected to have the same selectivity.

As to claims 12-13, it is well known that the temperature affects the reaction rate, therefore it would have been obvious to use the compositions at the temperatures cited because

the temperature appears to reflect a result-effective variable that can be optimized. See MPEP 2144.05 IIB.

As to claim 14, Wang teaches that solutions that comprise hydrogen peroxide (col.5, lines 65-67) are conventional in CMP solutions. It would have been obvious to one with ordinary skill in the art to use hydrogen peroxide in the modified method of Scherer because Wang teaches that this is a useful, conventional solution for CMP.

As to claims 15-19, see the rejection of claims 9-13.

Response to Amendment

The 35 USC 112, 2nd paragraph rejection is withdrawn since claim 8 has been amended to clarify that the removal rate of the TiW alloy and its residues is greater than the removal rate of Al, Cu or an AlCu alloy, and claim 14 specifies the composition. The 112 rejection over the term “substantially” is withdrawn, since although a broad term, does not create indefiniteness. The claims remain rejected over Scherber et al and Wang et al. Scherber discloses CMP of TiW with periodic acid.

Response to Arguments

Applicant's arguments filed July 11, 2006 have been fully considered but they are not persuasive. Applicant discusses paragraphs [0002] to [0021] and [0037] to [0039]. It is unclear which passages these correspond to since Scherber and Wang do not have paragraphs labeled.

Applicant argues that there is no relation between etching and CMP. This argument is not understood since CMP comprises etching – the chemical polishing is chemical etching. Etching, including CMP, inherently produces residues.

As to the argument that etching is used to form grooves in the substrate, examiner notes that the claims do not cite etching to form grooves.

As to the argument that CMP typically removes the excess of said other materials which were plated on after the etching/cleaning step, the rejection does not rely on plating, and its significance is not relevant since CMP produces residues from a previous step.

The prior art applied teaches CMP with a composition that has the same range of acid as in the instant invention. A two step CMP is obvious since Wang teaches to use a first CMP with a high selectivity to barrier layers (which produces at least some residues since there is at least some TiW etching), and then a second CMP to remove the barrier layer (which as taught by the primary reference may comprise TiW) and any residues that are present. The second removal rate is the same as that cited since it is the same as that cited in the claim (as is also desired so that the metal lines are not polished away).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO**

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Anita K Alanko
Primary Examiner
Art Unit 1765